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(54) CONSTRUCTION DRAWING PREPARING DEVICE

(57)Abstract:

PURPOSE: To easily and automatically prepare a detailed drawing for construction.

CONSTITUTION: The general drawing data of a plan prepared by CAD are fetched after parameters for recognition are set, outer wall instructions are read and unwanted line segments are removed (100-106). Members are recognized from these plan data corresponding to the presence/absence of circular arcs and line segments continued to the circular arcs and the position relation of straight lines or the like (108). Data expressing the recognized members are integrated for each member and labelled (110), the dimension or arrangement of respective members by the labels and data corresponding to the labels is standardized (112), the position or area on the plan corresponding to the standardized dimensions of respective members is decided, and the detailed drawing, for which the detailed dimension or the like for each member is decided, is automatically prepared and displayed on a display device (114).
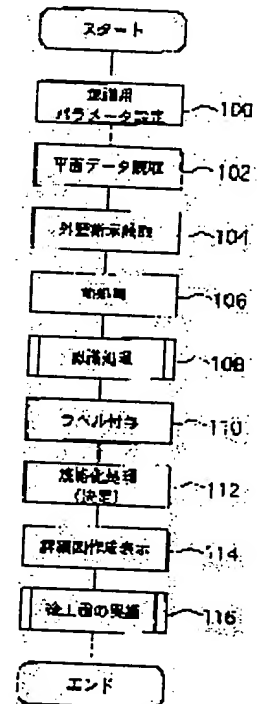
LEGAL STATUS

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[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

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[Date of extinction of right]

CLAIMS

[Claim(s)]
[Claim 1] The construction drawing listing device containing a decision means determine the dimension of each part of the member which shows the dimension and the cylinder of each part of a wall which have been recognized from plan data based on the recognition result of a recognition means recognize the member which shows a door, the fittings of an aperture, a wall, and a cylinder, and the aforementioned recognition means as the value which defined beforehand, and a creation means create detail drawing based on the recognition result and the value which were determined of the aforementioned plan data and the aforementioned

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[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] this invention starts a construction drawing listing device, and relates to the construction drawing listing device which recognizes members, such as a cylinder and a wall, from the plan data especially created by CAD etc., and creates the detail drawing for construction automatically.
[0002]
[Description of the Prior Art] The plan created by CAD is divided roughly into general drawing (refer to the drawing 5) and detail drawing (refer to the drawing 6). Although each drawing consists of the fittings of ****, a cylinder, a wall and a door, and an aperture etc., with detail drawing, an exact dimension, the frame of a finish line and fittings, etc. are finely expressed by general drawing to stopping at simple member representation. In order to create detail drawing by CAD conventionally, the time which must add fine representation in detail by the care force on the basis of general drawing, and an input takes was huge, and was inefficient work.
[0003]
[Problem(s) to be Solved by the Invention] It is the purpose that this invention obtains the construction drawing listing device which can create automatically the detail drawing used for construction from simple member representation of general drawing in consideration of the above-mentioned fact.
[0004]
[Means for Solving the Problem] A recognition means to recognize the member this invention indicates a door, the fittings of an aperture, a wall, and a cylinder to be from plan data in order to attain the above-mentioned purpose, A decision means to determine the dimension of each part of the member which shows the dimension and cylinder of each part of a wall which have been recognized based on the recognition result of the aforementioned recognition means as the value defined beforehand, and a creation means to create detail drawing based on the recognition result and the determined value of the aforementioned plan data and the aforementioned recognition means are included.
[0005]
[Function] According to this invention, the member data in which a door, the fittings of an aperture, a wall, a cylinder, etc. are shown, and the data in which the position of these members is shown are recognized from the general-drawing data of the plan beforehand created by CAD by the recognition means. This general-drawing data is data which expressed members, such as a door, the fittings of an aperture, a wall, and a cylinder, with the two-dimensional coordinate data, and the data with the detailed code data of a member etc. are graphic data which it does not have.
[0006] A decision means is determined as the value which defined beforehand the dimension of each part of the member which shows the dimension and cylinder of each part of a wall which have been recognized based on the recognition result of a recognition means. Therefore, the wall and cylinder which have been recognized may serve as detail drawing, and acquire a power value. And a creation means creates detail drawing based on the recognition result and the determined value of plan data and a recognition means.
[0007] Thus, according to this invention, the member which shows a wall, a cylinder, etc. is automatically recognized from the general-drawing data of a plan, from the recognition result of plan data and a recognition means, and the determined value, in order to create detail drawing, it is not necessary to input the input item for specifying a member required for detail drawing like before, and an entry of data can be made easy by this.
[0008]
[Example] Hereafter, with reference to a drawing, the example of this invention is explained in detail. Drawing 1 shows the schematic diagram of this example, and the personal computer 10 for a construction drawing creation is constituted including CPU, ROM, and RAM. The tablet (digitizer) 16 and the mouse 20 are connected to the personal computer 10. The electronic pen 18 is formed in the tablet 16, and by contacting the nose of cam of the electronic pen 18 on the front face of a tablet 16, and making it move, the move tracing is changed into sequence-of-points data, and is inputted in a personal computer 10. Moreover, the input by the mouse 20 is also possible.
[0009] As this tablet 16, the tablet combined with the LCD is desirable, and the menu selection in an electronic pen, the data, input in an electronic pen, etc. become easy by displaying a menu screen etc. on a LCD using this tablet. Moreover, it is also possible to connect the display for a display 12 (following, CRT) as an option.
[0010] The program of the construction drawing generating routine explained below is beforehand memorized by ROM of this

personal computer 10. This routine is explained below.

[0011] First, an operator turns on the power of a construction drawing listing device, and chooses the general-drawing data of the plan beforehand created by CAD by choosing the menu displayed on the tablet 16 or CRT12. Moreover, an operator does the outer wall designation to the read plan data. This outer wall designation is made to the segment determined as an outer wall with the electronic pen 18 or the mouse 20, and the position of this segment and a segment is recorded on RAM as outer wall data.

[0012] The example of the general-drawing data of a plan is shown in drawing 5 . An aperture is drawn, a wall is drawn by two parallel lines, a door is drawn by the segment which follows radii and these radii, and the stairway (in part [in drawing 5] chisel) is drawn [a cylinder is drawn on this plan by three parallel lines near the intersection of a segment which passes and expresses the heart, and] on it by much parallel lines. namely, this plan data -- a plan -- each -- it is expressed only with the two-dimensional graphic data showing a segment, radii, etc.

[0013] At step 100 of drawing 2 , the parameter for recognition processing mentioned later is set up. This parameter is used in order to recognize a member from a segment, a circle, and radii, it has a number, physical relationship, etc. of radii which adjoin each other so that it may explain below, in addition is prepared if needed. Moreover, at this step 100, each of detailed data, such as various dimensions of a member, is set up as a default value. This default value is equipped with two or more values to one member, and may be made to set them up by selection etc. suitably. The plan data currently recorded on RAM are incorporated at the following step 102.

[0014] At the following step 104, the outer wall data and finishing data which were memorized by RAM are read. As the following step 106 is shown in drawing 10 (1) - (3), pretreatment which therefore removes or unifies the unnecessary segment for which sets two or more overlapping segments to one, or makes the segment with which a part laps one or two adjacent segments, or the segment of one way piece ****** is unified, and which remains to plan data is performed. In addition, a short segment is eliminated, while a long segment is made to remain, in case two or more overlapping segments are set to one. In this case, when it is the same length, only the segment updated at the end is made to remain. the segment with which a part laps makes the segment of the longer one about a duplication fraction remain, when the layers which are fields differ for example, illustrating, when it receives a different object, and when it receives the same object, it is unified to one segment (for example, when a layer is the same)

[0015] The member data which express with the following step 108 the member which shows fittings, a wall, and a cylinder based on the recognition routine which mentions a detail later are extracted, and the member which shows a cylinder, a wall, fittings, etc. is recognized. The label for specifying a member as the data which unified and unified the data which express with the following step 110 the member recognized as mentioned above for every member is given. The data aggregate and a member can be made to correspond from this label.

[0016] At step 112, the data corresponding to a label and a label are judged, the position and field on the plan of each part material are judged, and standardization processing which determines the detailed dimension of each part material to which the label was given as it mentioned later is performed. And detail drawing (drawing 6) is automatically created using the technique known for CAD using the detailed coordinate data which becomes settled for every each part material as which a dimension and a detailed position, and a detailed field were determined in step 114, and it displays on the tablet 16 or CRT12. The example of the detail drawing automatically created from the plan (general drawing) of drawing 5 is shown in drawing 6 .

[0017] Next, the parameter setup for recognition processing of step 100 is explained. Many doors and the fittings of an aperture are inputted into the plan for construction. An example of these fittings inputted was shown in drawing 9 . A frame (three-way-type frame) can express the frame which is in a wall by there being no segment around a wall as shown in drawing 9 (1). a door (door) can express a piece aperture door with the position and length of radii from a segment which adjoin with one radii, as shown in drawing 9 (2), (3), and (6), and it can express a double door door with the position, the length, and radius of radii from the segment which adjoins with two radii so that drawing 9 (4), (5), and (7) may be resembled and it may be shown As shown in drawing 9 (8) and (9), the difference in arrangement of a segment can express a door. as it is alike and it is shown in drawing 9 (10), a predetermined segment (this example dashed line) can express a shutter As shown in drawing 9 (11) and (12), an aperture is expressed with three or more parallel segments, and can do ******. It is set up as a parameter with which the standard value of arrangement of the existence of these radii or a segment, the length of radii or a segment, radii, the number and the radii of a segment, or a segment serves as a decision criterion.

[0018] Moreover, a dimension general to indicating an exact dimension with the dimension line, or indicating around a member or an attached table is indicated, and it is omitting in many cases within a plan. For this reason, a dimension etc. shall be read in the plan data described as follows in this example. Fundamentally, along with the dimension line, a numeric value is indicated with the dimension line. Moreover, a numeric value is indicated around a member. The member these numeric values are not indicated to be makes a default value the numeric value indicated in the format shown in the next table 1. In addition, about the dimension indicated in the following tables or a plan, a prism is written by x (dimension of the orientation of x) (dimension of the orientation of y) with a notation "x", a circular cylinder writes only a numeric value, and a wall thickness is written by W (wall thickness) using notation "W". The unit in this case is set to mm.

[0019]
[Table 1]

特記無き限り	
柱	：６５０×６５０
丸柱	：８５０
G大梁	：４５０×９００
B大梁	：４５０×９００
小梁	：３５０×６５０
外壁	：W１８０
内壁	：W１５０
□印は耐震壁を示す	
スラブ	

[0020] Moreover, the wall has two or more modalities. For this reason, the modality of wall was classified and written to the following tables. By filling in this table, a detailed setup can be performed at the detail drawing creation time.
[0021]
[Table 2]

壁種	壁厚	仕上げ厚
R C		30/20
L G S	120	20
ブロック	110	20
A L C	150	25

[0022] in addition, the above-mentioned Table 1 and 2 -- illustrating of a plan -- it is desirable to classify into the layer defined beforehand and to be indicated so that it can distinguish at the time of a recognition at the time moreover, a passage -- the heart, a wall, a cylinder, fittings, and the dimension line -- illustrating of a plan -- it is desirable to classify into the layer beforehand defined at the time, and to be indicated

[0023] Next, the recognition routine which recognizes the member of step 108 with reference to drawing 3 is explained. This member recognition is recognized in the order of the heart, ** fittings, ** wall, ** cylinder, and ** others as **. First, plan data are incorporated, it passes in step 201 from RAM, in step 200, and the heart is recognized. It judges whether radii exist at the following step 202, when radii do not exist, it progresses to step 210, when radii exist, it judges whether the segment which follows the radii the end was judged to be at step 202 in step 204 exists, and when decision of step 204 is affirmation, it judges whether the other end of the segment judged at step 204 in step 206 is in agreement with the center of radii. Extraction data are eliminated, while data extraction of the modality of door is determined and carried out, when decision of step 206 is affirmation. For example, as shown in drawing 11 , while it judges that the symbol of the door drawn by the segment S as radii A exists, this radii A and segment S are extracted as data of door D and this extracted door data is recorded on the predetermined area of RAM, it deletes from plan data. When determining the modality of door in this step 208, the parameter of many doors explained above is referred to (refer to drawing 9 (1) - (7)). On the other hand, when decision of step 204 and step 206 is negative, it progresses to step 210 as it is.

[0024] Since three parallel-lines P is drawn as an aperture as it indicates that above-mentioned explanation was given to drawing 12 with a construction drawing, for example, Judge whether in step 210, three or more parallel lines, for example, three parallel lines with an equal length, exist, and when it exists The modality of aperture is determined, these three parallel lines are extracted as aperture data, and while recording on the predetermined area of RAM, this extracted aperture data is eliminated , from plan data. When determining the modality of aperture in this step 212, the parameter with which an aperture is expressed like the case of the above-mentioned door is referred to (refer to drawing 9 (11) and (12)).

[0025] Moreover, since a door and a shutter are expressed by the construction drawing in the combination of a specific line type

or a different line type, Judge whether in step 230, the combination of a specific line type or a different line type exists, and when it exists The modality of door is determined from these line types, a specific line type or a specific different line type is extracted as door data, and while recording on the predetermined area of RAM, this extracted door data is eliminated from plan data. When determining the modality of door in this step 232, the parameter with which a door is expressed like the case of the above-mentioned door is referred to (refer to drawing 9 (8) - (10)).

[0026] Furthermore, in a construction drawing, two parallel lines are drawn as a wall. Moreover, there is a case where the cylinder is buried in a wall. For this reason, when it judges whether two parallel lines exist at the following step 214 and it is judged that two parallel lines exist, parallel lines are divided in step 215 and two parallel lines with an equal length are extracted as wall data in step 216, and while the extracted data are recorded on the predetermined area of RAM, it eliminates from plan data.

[0027] In this case, as shown in drawing 13 (1), it is parallel to **** C1, C2, and C3, and, as for the parallel lines located in the equal distance, a segment L7 and the segment L8 are searched corresponding to a segment L3, the segment L4, and **** C3 corresponding to a segment L1, the segments L2, L5, and L6, and **** C2 corresponding to **** C1. this time -- one wall -- on the way -- the segment which doubles with the length of **** C1, C2, and C3, and expresses a wall as shown in drawing 13 (2) in consideration of coming out and modalities differing -- segments L1 and L8 are divided Next, segments L1 and L2 are divided so that it may become the group of the parallel lines with an equal length, as shown in drawing 13 (3). Then, as shown in drawing 13 (4), two segments with an equal length which are the groups of parallel lines are recognized to be walls, make this wall data, and extract and eliminate it.

[0028] Thus, since the cylinder is contained in the plan data from which the parallel lines of the fraction recognized to be a wall were eliminated, the segment which passes as shown in drawing 13 (5), and remains heart R or near the intersection of **** C1, C2, and C3 is searched with the following step 218, the searched segment is connected, and a closed graphic is created. In this case, as between the endpoints of a segment serves as a curtate distance, it creates a closed graphic. Next, it judges whether when the area of a closed graphic distinguishes whether it is beyond a predetermined value (this example 600x 600= 3600mm) in step 220, a closed square shape exists near the intersection, and as shown in drawing 13 (6), when area is beyond a predetermined value, a closed graphic recognizes it as it being a cylinder, and progresses to step 220. On the other hand, as shown in drawing 13 (7), while area records the data which the closed graphic has recognized to be a part of wall in the case of negative judgment, extracted as wall data, and were extracted on the predetermined area of RAM under with a predetermined value, it eliminates from plan data.

[0029] As step 220 is shown in drawing 14 (1) - (3), the modality of cylinder If all interior angles is [a closed graphic] abbreviation right angles in four square shapes and the center of radii has the same "prism" closed graphic only with radii, a "circular cylinder", If it is except these, it is determined that it will be either of the "variant cylinders", a closed graphic is extracted as cylinder data, and while the extracted data are recorded on the predetermined area of RAM, it eliminates from plan data.

[0030] In addition, as a cylinder is not buried in a wall but it is shown in drawing 11 only in the case of a wall, a door is recognized, and since door data are eliminated from plan data (step 208), the group of two parallel lines P1 and P2 and the group of two parallel lines P3 and P4 are recognized as walls W1 and W2. segments P6 and P7 -- a segment -- since it becomes P5 and a group and one wall is constituted, the segments P6 and P7 separated at the narrow spacing are recognized as one segment, and can recognize a wall W3 by the group of segments P6 and P7 and P5

[0031] Moreover, when only a cylinder exists independently, in step 218 and step 220, a cylinder is recognized like the above-mentioned processing.

[0032] Next, standardization processing which determines the detailed dimension of step 112 is explained. Standardization processing in this example includes the write-in dimension recognition. Moreover, at this step 112, the outer wall data by the outer wall designation recorded on RAM which gave [above-mentioned] explanation are referred to. First, the dimension recognition of the member with a write-in dimension is searched and carried out. In this case, it searches according to the same sequence as the above-mentioned member recognition processing, and a dimension recognition is carried out. With reference to Table 1 or 2 explained above, the dimension recognition of the member without a write-in dimension is carried out. As shown in drawing 15 (1), when the dimension (W180) is filled in near the wall, the line of both sides, i.e., the data which write in parallel lines by making it move the same amount every on the basis of **** C5, and are in agreement with a dimension, is generated focusing on **** C5. In addition, since outer wall designation is made as explained above, when the corresponding wall is an outer wall, an external position is made to fix and it may be made to move an internal position.

[0033] When it writes in a cylinder and there is a dimension, a detailed dimension is determined after this cylinder carries out a dimension recognition. Since it faces moving the position of the segment and radii which standardize a cylinder and criteria are needed, a reference point or the datum line is set up.

[0034] For example, as shown in drawing 15 (2), when only the dimension (800x1000) is filled in near the cylinder, it recognizes as a common type cylinder. in this case -- since one segment of the recognized cylinder is in agreement with the segment showing a wall, while the segment of a cylinder is located in the datum line, using as the datum line the segment which was in agreement with the segment showing this wall -- a passage -- a heart R2 top -- a reference point (intersection of the diagonal line of a cylinder) -- being located -- as -- each -- the data which write in by moving a segment and are in agreement with a dimension are generated

[0035] it is shown in drawing 15 (3) -- as -- a notation "*" -- with -- the case where the dimension (*800x1000) is filled in near the cylinder -- a wall separation type cylinder ****** -- recognizing -- a passage -- the intersection of the heart -- a reference

point -- carrying out -- this reference point **** -- each -- the data which write in by moving a segment and are in agreement with a dimension are generated

[0036] When the cylinder recognized as shown in <u>drawing 15</u> (4) does not touch outside but exists in the interior, the data which write in on the basis of the intersection of the diagonal line of a cylinder, and are in agreement with a dimension are generated.

[0037] since [in addition,] there is little other relevance when a cylinder exists independently -- a passage -- the intersection of the heart -- a reference point -- carrying out -- each -- what is necessary is just to generate the data which write in by moving a segment and are in agreement with a dimension

[0038] Moreover, when the cylinder has been recognized in contact with an outer wall, it carries out like the following [setup of criteria], and a reference point is set up.

[0039] [A setup of criteria]

** In the case of a prism (a polygon is included), among the periphery sides of - cylinder (each other was adjoined), the 2nd page and when a wall is in the same side, let this intersection of the 2nd page be a reference point (refer to <u>drawing 16</u> (1)).

- Among the periphery sides of a cylinder, when a wall is in the same side with the 1st page of either, let the intersection of the heart be a reference point as this field (refer to <u>drawing 16</u> (2)).

- the case where there is no ** of the periphery side of a cylinder in the same field as a wall -- a passage -- the heart --.let an intersection be a reference point (refer to <u>drawing 16</u> (3))

** Let the intersection of the heart be a reference point as the case of an independent cylinder and a tubular pole (refer to <u>drawing 17</u> (1)).

** A rectangle cylinder passes, and when not parallel to the heart (or ****), let the intersection of the heart be a reference point a passage (refer to <u>drawing 17</u> (2)).

** When the passage heart does not lie at right angles, let the intersection of the heart be a reference point a passage (refer to <u>drawing 17</u> (3)).

[0040] In addition, standardization of a variant cylinder is processed only when there is a write-in dimension. When radii are not included, this processing makes the intersection of an outer wall a reference point, or makes the intersection of the passage heart a reference point. On the other hand, when radii are included, according to write-in data, it is determined that they will be a circular cylinder or a prism, and it processes.

[0041] Thus, the position and field on the plan of each part material are judged, and since the detailed coordinate data which becomes settled for every each part material as which a dimension and a detailed position, and a detailed field were determined since standardization processing which determines the detailed dimension of each part material was performed can be found, detail drawing (<u>drawing 6</u>) can be created automatically easily.

[0042] Next, back process processing of step 116 is explained with reference to the development generating routine of <u>drawing 4</u> . An operator specifies the domain (domain enclosed with the dotted line of <u>drawing 7</u>) which creates a development with reference to the tablet 16 or CRT12 as which the detail drawing created automatically is displayed. The data with the detailed member contained within limits the step 300 smell lever was specified to be are read, and the height data (floor height) inputted at the following step 302 are read. A development (<u>drawing 8</u>) is automatically created using the technique known for CAD using the data and height data of a member which were read, and it expresses to the tablet 16 or CRT12 as the following step 304.

[0043] Since it recognizes in the order of the fittings of a door (door) or an aperture, a wall, and a cylinder according to this example as explained above Since the member which mistakes each part material, can recognize that there is nothing, and has been recognized is standardized to detailed data While members, such as **** of general drawing drawn by CAD, a cylinder, a wall, and fittings, a write-in dimension and a dimension table in case write in and there is nothing, and the finishing thick table of a wall class are recognized and a member dimension is standardized The automatic generation of a finishing line and the dimension line can be carried out, and a detailed drawing can be easily created from simple drawing data.

[0044]

[Effect of the Invention] As explained above, in order according to this invention to determine that it will be the value which defined beforehand the dimension of each part of the member which shows the dimension and cylinder of each part of a wall which recognize the member which shows a wall, a cylinder, etc. and have been recognized from the general-drawing data of a plan and to create detail drawing, It is necessary to input neither creating detail drawing by the handicraft from general drawing like before, nor data detailed per each part material, and the effect that detail drawing can be easily obtained only by the input of simple graphic data is acquired.

[Translation done.]
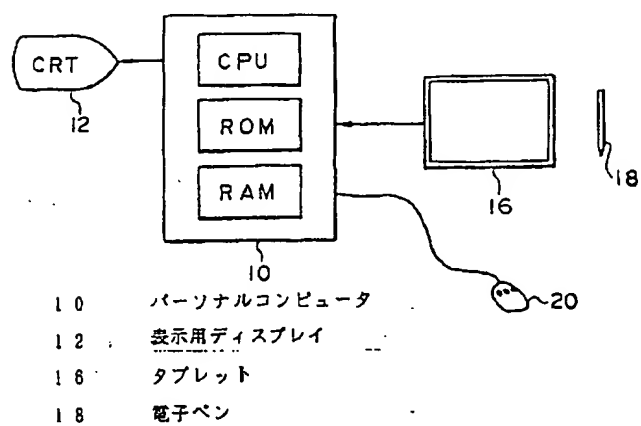
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the schematic diagram showing the example of this invention.
[Drawing 2] It is the ** view showing the construction drawing generating routine of this example.
[Drawing 3] It is the ** view showing the recognition routine which recognizes a member.
[Drawing 4] It is the ** view showing the operation routine of the back process which creates a development.
[Drawing 5] It is drawing showing the example of the plan of a construction drawing.
[Drawing 6] It is drawing showing the example of the detail drawing of a construction drawing.
[Drawing 7] It is drawing showing the example of the detail drawing displayed in order to create the development of a construction drawing.
[Drawing 8] It is drawing showing the example of the development of a construction drawing.
[Drawing 9] It is the partial diagrammatic view showing the symbol of a door, a door, and an aperture.
[Drawing 10] It is the flow chart showing a pretreatment routine.
[Drawing 11] It is explanatory drawing showing the procedure of extracting door data and wall data.
[Drawing 12] It is the partial diagrammatic view showing the symbol of an aperture.
[Drawing 13] It is explanatory drawing for explaining the recognition process of a cylinder.
[Drawing 14] It is the diagram showing the modality of cylinder.
[Drawing 15] It is explanatory drawing for explaining standardization processing.
[Drawing 16] It is explanatory drawing for explaining a setup of criteria about a prism.
[Drawing 17] It is explanatory drawing for explaining a setup of criteria about various cylinders.
[Description of Notations]
10 Personal Computer
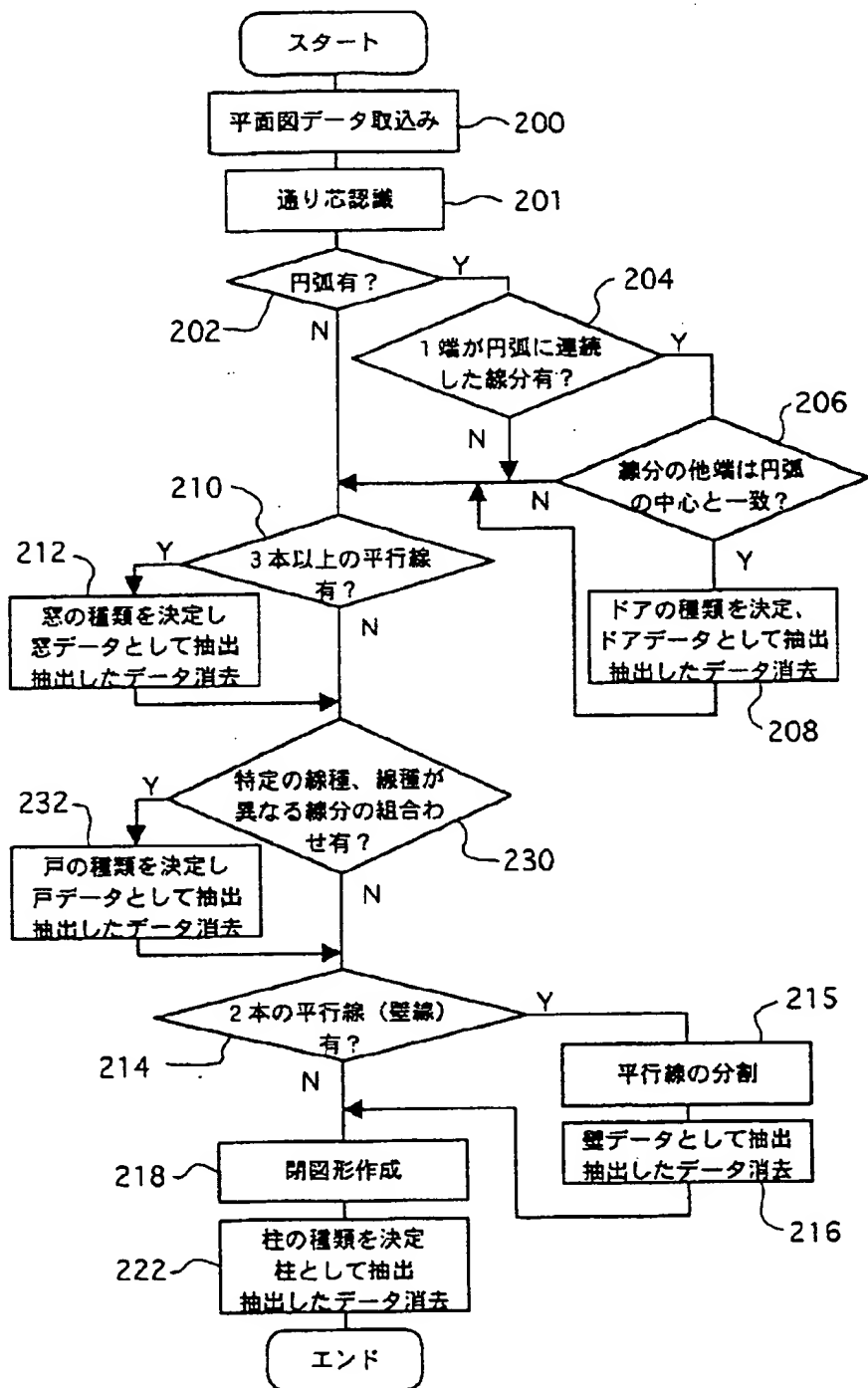12 Display for Display
16 Tablet
18 Electronic Pen

[Translation done.]

CRT

CPU

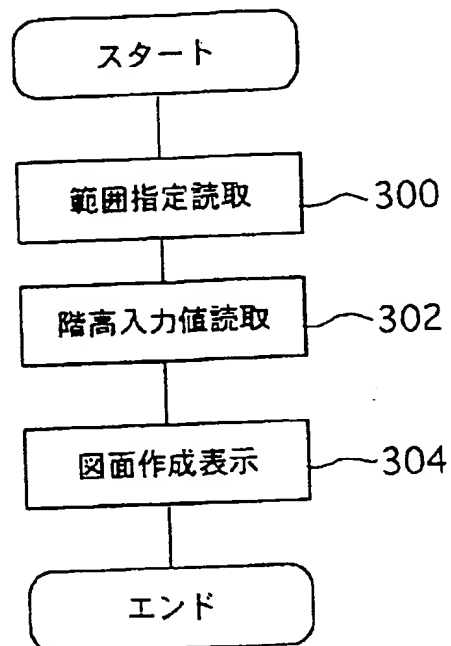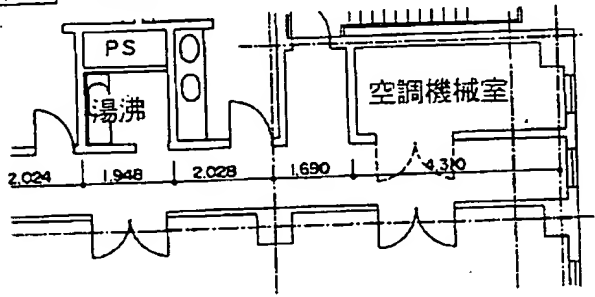ROM

RAM

12

10

16

18

20

10	パーソナルコンピュータ
12	表示用ディスプレイ
16	タブレット
18	電子ペン

[Translation done.]

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         ┌─────────────┐
         │   スタート    │
         └──────┬──────┘
                │
         ┌─────────────┐
         │    認識用     │ ～100
         │ パラメータ設定  │
         └──────┬──────┘
                │
         ┌─────────────┐
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         └──────┬──────┘
                │
         ┌─────────────┐
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         └──────┬──────┘
                │
         ┌─────────────┐
         │    前処理     │ ～106
         └──────┬──────┘
                │
         ┌┤─────────┤┐
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         ┌─────────────┐
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         │    (決定)     │
         └──────┬──────┘
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         ┌─────────────┐
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         └──────┬──────┘
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         ┌┤─────────┤┐
         ││ 後工程の実施 ││ ～116
         └┤─────────┤┘
                │
         ┌─────────────┐
         │    エンド     │
         └─────────────┘
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[Translation done.]

スタート

平面図データ取込み ～ 200

通り芯認識 ～ 201

円弧有？ 202

1端が円弧に連続した線分有？ 204

線分の他端は円弧の中心と一致？ 206

3本以上の平行線有？ 210

窓の種類を決定し窓データとして抽出抽出したデータ消去 212

ドアの種類を決定、ドアデータとして抽出抽出したデータ消去 208

特定の線種、線種が異なる線分の組合わせ有？ 230

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エンド

```
   ┌─────────────┐
   │   スタート   │
   └─────────────┘
          │
   ┌─────────────┐
   │  範囲指定読取  │─────300
   └─────────────┘
          │
   ┌─────────────┐
   │ 階高入力値読取 │─────302
   └─────────────┘
          │
   ┌─────────────┐
   │  図面作成表示  │─────304
   └─────────────┘
          │
   ┌─────────────┐
   │    エンド    │
   └─────────────┘
```

[Translation done.]

平面 平面図

PS

湯沸

空調機械室

2,024 | 1,948 | 2,028 | 1,690 | 4,310

[Translation done.]

Drawing selection　Drawing 6　▼

[Translation done.]
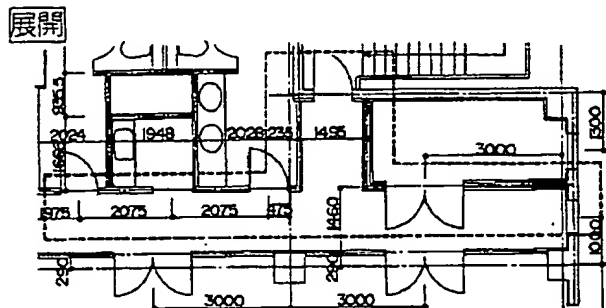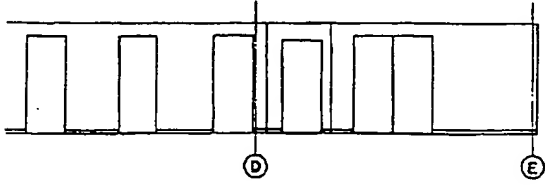
9/14/01 10:35 AM

展開

[Translation done.]

[Translation done.]

(1)　三方枠

(2)　片開き扉

(3)　片開き扉（180°開き）

(4)　両開き扉

(5)　親子扉

(6)　片開き自由扉

(7)　両開き自由扉

(8)　引違い戸

(9)　片引き戸

(10)　シャッター

(11)　引違い窓
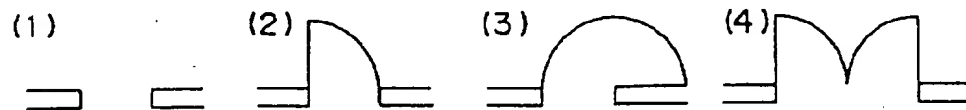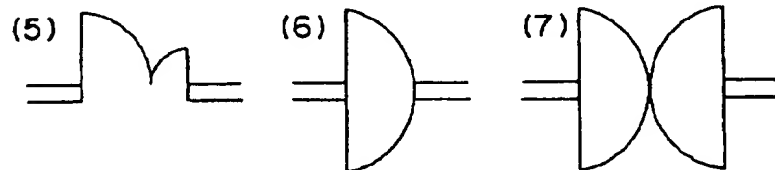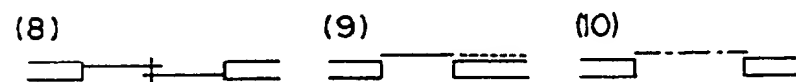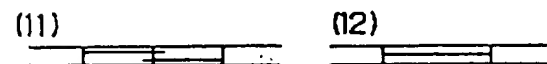
(12)　はめ殺し窓等

[Translation done.]

線分が重なっている場合
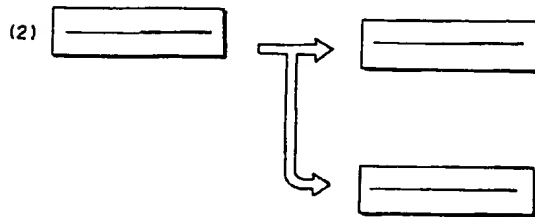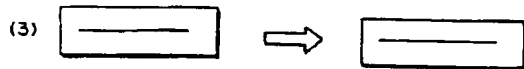
(1)

線分の一部が重なっている場合

(2)

1本の線が途中で切れている場合

(3)

[Translation done.]

[Translation done.]

Drawing selection   Drawing 12   ▼

P

[Translation done.]

Drawing selection   Drawing 13   ▼

(1) C1   L1
L2 L3 L4 L5 L6 L8
C2 L5 L7 C3
⇩

(2)
⇩

(3)
⇩

(4)
⇩

(5) R

(6)

(7)
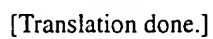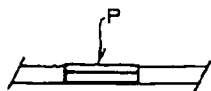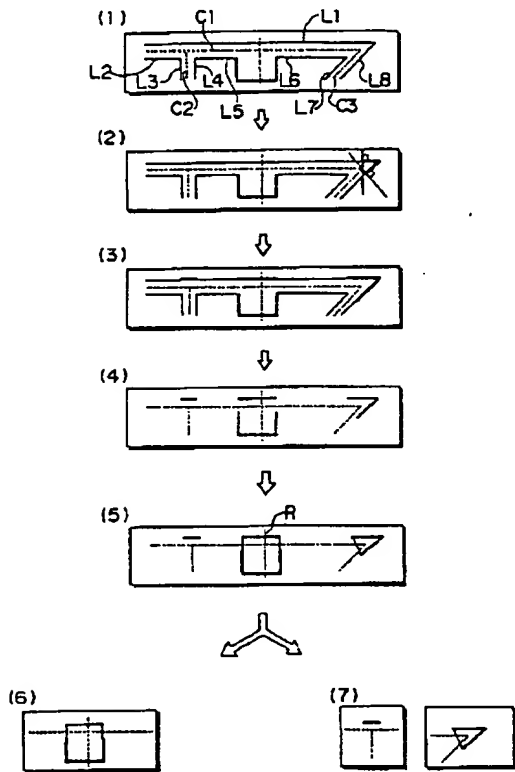
[Translation done.]

「角柱」

(1)
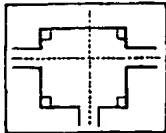
「円柱」

(2)
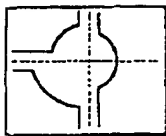
「異形柱」

(3)

[Translation done.]

(1)

W180

C5

(2)

R2

L10

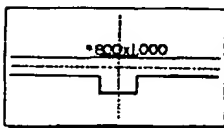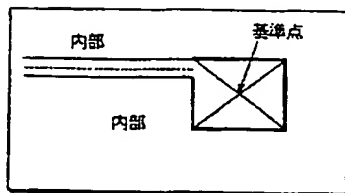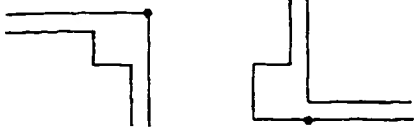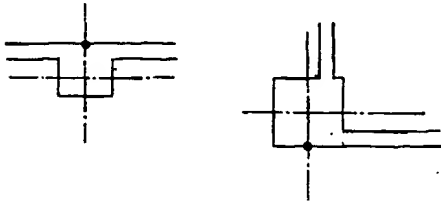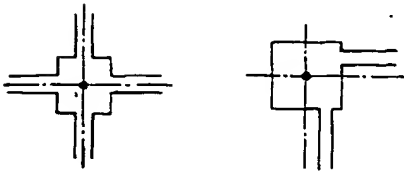800×1,000

C6

(3)

•800×1,000•

(4)

内部

基準点

内部
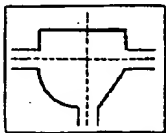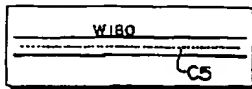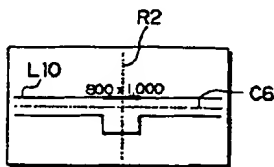
[Translation done.]

Drawing selection : Drawing 16 ▼

(1)

(2)

(3)

[Translation done.]

(1)

(2)

(3)
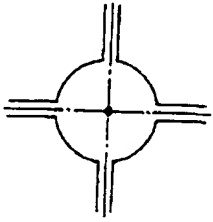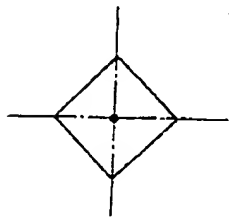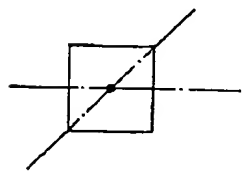
[Translation done.]

* NOTICES *

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 damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

Field

[Field of the Invention] this invention starts a construction drawing listing device, and relates to the construction drawing listing device which recognizes members, such as a cylinder and a wall, from the plan data especially created by CAD etc., and creates the detail drawing for construction automatically.

[Translation done.]

* NOTICES *

Technique

[Description of the Prior Art] The plan created by CAD is divided roughly into general drawing (refer to the drawing 5) and detail drawing (refer to the drawing 6). Although each drawing consists of the fittings of ****, a cylinder, a wall and a door, and an aperture etc., with detail drawing, an exact dimension, the frame of a finish line and fittings, etc. are finely expressed by general drawing to stopping at simple member representation. In order to create detail drawing by CAD conventionally, the time which must add fine representation in detail by the care force on the basis of general drawing, and an input takes was huge, and was inefficient work.

[Translation done.]

MEANS

[Means for Solving the Problem] A recognition means to recognize the member this invention indicates a door, the fittings of an aperture, a wall, and a cylinder to be from plan data in order to attain the above-mentioned purpose, A decision means to determine the dimension of each part of the member which shows the dimension and cylinder of each part of a wall which have been recognized based on the recognition result of the aforementioned recognition means as the value defined beforehand, and a creation means to create detail drawing based on the recognition result and the determined value of the aforementioned plan data and the aforementioned recognition means are included.

[Translation done.]

OPERATION

[Function] According to this invention, the member data in which a door, the fittings of an aperture, a wall, a cylinder, etc. are shown, and the data in which the position of these members is shown are recognized from the general-drawing data of the plan beforehand created by CAD by the recognition means. This general-drawing data is data which expressed members, such as a door, the fittings of an aperture, a wall, and a cylinder, with the two-dimensional coordinate data, and the data with the detailed code data of a member etc. are graphic data which it does not have.

[0006] A decision means is determined as the value which defined beforehand the dimension of each part of the member which shows the dimension and cylinder of each part of a wall which have been recognized based on the recognition result of a recognition means. Therefore, the wall and cylinder which have been recognized may serve as detail drawing, and acquire a power value. And a creation means creates detail drawing based on the recognition result and the determined value of plan data and a recognition means.

[0007] Thus, according to this invention, the member which shows a wall, a cylinder, etc. is automatically recognized from the general-drawing data of a plan, from the recognition result of plan data and a recognition means, and the determined value, in order to create detail drawing, it is not necessary to input the input item for specifying a member required for detail drawing like before, and an entry of data can be made easy by this.

[Translation done.]

EXAMPLE

[Example] Hereafter, with reference to a drawing, the example of this invention is explained in detail. Drawing 1 shows the schematic diagram of this example, and the personal computer 10 for a construction drawing creation is constituted including CPU, ROM, and RAM. The tablet (digitizer) 16 and the mouse 20 are connected to the personal computer 10. The electronic pen 18 is formed in the tablet 16, and by contacting the nose of cam of the electronic pen 18 on the front face of a tablet 16, and making it move, the move tracing is changed into sequence-of-points data, and is inputted in a personal computer 10. Moreover, the input by the mouse 20 is also possible.

[0009] As this tablet 16, the tablet combined with the LCD is desirable, and the menu selection in an electronic pen, the data input in an electronic pen, etc. become easy by displaying a menu screen etc. on a LCD using this tablet. Moreover, it is also possible to connect the display for a display 12 (following, CRT) as an option.

[0010] The program of the construction drawing generating routine explained below is beforehand memorized by ROM of this personal computer 10. This routine is explained below.

[0011] First, an operator turns on the power of a construction drawing listing device, and chooses the general-drawing data of the plan beforehand created by CAD by choosing the menu displayed on the tablet 16 or CRT12. Moreover, an operator does the outer wall designation to the read plan data. This outer wall designation is made to the segment determined as an outer wall with the electronic pen 18 or the mouse 20, and the position of this segment and a segment is recorded on RAM as outer wall data.

[0012] The example of the general-drawing data of a plan is shown in drawing 5 . An aperture is drawn, a wall is drawn by two parallel lines, a door is drawn by the segment which follows radii and these radii, and the stairway (in part [in drawing 5] chisel) is drawn [a cylinder is drawn on this plan by three parallel lines near the intersection of a segment which passes and expresses the heart, and] on it by much parallel lines. namely, this plan data -- a plan -- each -- it is expressed only with the two-dimensional graphic data showing a segment, radii, etc.

[0013] At step 100 of drawing 2 , the parameter for recognition processing mentioned later is set up. This parameter is used in order to recognize a member from a segment, a circle, and radii, it has a number, physical relationship, etc. of radii which adjoin each other so that it may explain below, in addition is prepared if needed. Moreover, at this step 100, each of detailed data, such as various dimensions of a member, is set up as a default value. This default value is equipped with two or more values to one member, and may be made to set them up by selection etc. suitably. The plan data currently recorded on RAM are incorporated at the following step 102.

[0014] At the following step 104, the outer wall data and finishing data which were memorized by RAM are read. As the following step 106 is shown in drawing 10 (1) - (3), pretreatment which therefore removes or unifies the unnecessary segment for which sets two or more overlapping segments to one, or makes the segment with which a part laps one or two adjacent segments, or the segment of one way piece ****** is unified, and which remains to plan data is performed. In addition, a short segment is eliminated, while a long segment is made to remain, in case two or more overlapping segments are set to one. In this case, when it is the same length, only the segment updated at the end is made to remain. the segment with which a part laps makes the segment of the longer one about a duplication fraction remain, when the layers which are fields differ for example, illustrating, when it receives a different object, and when it receives the same object, it is unified to one segment (for example, when a layer is the same)

[0015] The member data which express with the following step 108 the member which shows fittings, a wall, and a cylinder based on the recognition routine which mentions a detail later are extracted, and the member which shows a cylinder, a wall, fittings, etc. is recognized. The label for specifying a member as the data which unified and unified the data which express with the following step 110 the member recognized as mentioned above for every member is given. The data aggregate and a member can be made to correspond from this label.

[0016] At step 112, the data corresponding to a label and a label are judged, the position and field on the plan of each part material are judged, and standardization processing which determines the detailed dimension of each part material to which the label was given as it mentioned later is performed. And detail drawing (drawing 6) is automatically created using the technique known for CAD using the detailed coordinate data which becomes settled for every each part material as which a dimension and a detailed position, and a detailed field were determined in step 114, and it displays on the tablet 16 or CRT12. The example of the detail drawing automatically created from the plan (general drawing) of drawing 5 is shown in drawing 6 .

[0017] Next, the parameter setup for recognition processing of step 100 is explained. Many doors and the fittings of an aperture are inputted into the plan for construction. An example of these fittings inputted was shown in drawing 9 . A frame (three-way-type frame) can express the frame which is in a wall by there being no segment around a wall as shown in drawing 9

'(1). a door (door) can express a piece aperture door with the position and length of radii from a segment which adjoin with one radii, as shown in drawing 9 (2), (3), and (6), and it can express a double door door with the position, the length, and radius of radii from the segment which adjoins with two radii so that drawing 9 (4), (5), and (7) may be resembled and it may be shown As shown in drawing 9 (8) and (9), the difference in arrangement of a segment can express a door. as it is alike and it is shown in drawing 9 (10), a predetermined segment (this example dashed line) can express a shutter As shown in drawing 9 (11) and (12), an aperture is expressed with three or more parallel segments, and can do ******. It is set up as a parameter with which the standard value of arrangement of the existence of these radii or a segment, the length of radii or a segment, radii, the number and the radii of a segment, or a segment serves as a decision criterion.

[0018] Moreover, a dimension general to indicating an exact dimension with the dimension line, or indicating around a member or an attached table is indicated, and it is omitting in many cases within a plan. For this reason, a dimension etc. shall be read in the plan data described as follows in this example. Fundamentally, along with the dimension line, a numeric value is indicated with the dimension line. Moreover, a numeric value is indicated around a member. The member these numeric values are not indicated to be makes a default value the numeric value indicated in the format shown in the next table 1. In addition, about the dimension indicated in the following tables or a plan, a prism is written by x (dimension of the orientation of x) (dimension of the orientation of y) with a notation "x", a circular cylinder writes only a numeric value, and a wall thickness is written by W (wall thickness) using notation "W]. The unit in this case is set to mm.

[0019]

[Table 1]

特記無き限り	
柱	： ６ ５ ０ × ６ ５ ０
丸柱	： ８ ５ ０
Ｇ大梁	： ４ ５ ０ × ９ ０ ０
Ｂ大梁	： ４ ５ ０ × ９ ０ ０
小梁	： ３ ５ ０ × ６ ５ ０
外壁	： Ｗ１ ８ ０
内壁	： Ｗ１ ５ ０
□印は耐震壁を示す	
スラブ	

[0020] Moreover, the wall has two or more modalities. For this reason, the modality of wall was classified and written to the following tables. By filling in this table, a detailed setup can be performed at the detail drawing creation time.

[0021]

[Table 2]

壁種	壁厚	仕上げ厚
ＲＣ		30/20
ＬＧＳ	120	20
ブロック	110	20
ＡＬＣ	150	25

[0022] in addition, the above-mentioned Table 1 and 2 -- illustrating of a plan -- it is desirable to classify into the layer defined beforehand and to be indicated so that it can distinguish at the time of a recognition at the time moreover, a passage -- the heart, a wall, a cylinder, fittings, and the dimension line -- illustrating of a plan -- it is desirable to classify into the layer beforehand defined at the time, and to be indicated

[0023] Next, the recognition routine which recognizes the member of step 108 with reference to drawing 3 is explained. This

member recognition is recognized in the order of the heart, ** fittings, ** wall, ** cylinder, and ** others as **. First, plan data are incorporated, it passes in step 201 from RAM, in step 200, and the heart is recognized. It judges whether radii exist at the following step 202, when radii do not exist, it progresses to step 210, when radii exist, it judges whether the segment which follows the radii the end was judged to be at step 202 in step 204 exists, and when decision of step 204 is affirmation, it judges whether the other end of the segment judged at step 204 in step 206 is in agreement with the center of radii. Extraction data are eliminated, while data extraction of the modality of door is determined and carried out, when decision of step 206 is affirmation. For example, as shown in drawing 11 , while it judges that the symbol of the door drawn by the segment S as radii A exists, this radii A and segment S are extracted as data of door D and this extracted door data is recorded on the predetermined area of RAM, it deletes from plan data. When determining the modality of door in this step 208, the parameter of many doors explained above is referred to (refer to drawing 9 (1) - (7)). On the other hand, when decision of step 204 and step 206 is negative, it progresses to step 210 as it is.

[0024] Since three parallel-lines P is drawn as an aperture as it indicates that above-mentioned explanation was given to drawing 12 with a construction drawing, for example, Judge whether in step 210, three or more parallel lines, for example, three parallel lines with an equal length, exist, and when it exists The modality of aperture is determined, these three parallel lines are extracted as aperture data, and while recording on the predetermined area of RAM, this extracted aperture data is eliminated from plan data. When determining the modality of aperture in this step 212, the parameter with which an aperture is expressed like the case of the above-mentioned door is referred to (refer to drawing 9 (11) and (12)).

[0025] Moreover, since a door and a shutter are expressed by the construction drawing in the combination of a specific line type or a different line type, Judge whether in step 230, the combination of a specific line type or a different line type exists, and when it exists The modality of door is determined from these line types, a specific line type or a specific different line type is extracted as door data, and while recording on the predetermined area of RAM, this extracted door data is eliminated from plan data. When determining the modality of door in this step 232, the parameter with which a door is expressed like the case of the above-mentioned door is referred to (refer to drawing 9 (8) - (10)).

[0026] Furthermore, in a construction drawing, two parallel lines are drawn as a wall. Moreover, there is a case where the cylinder is buried in a wall. For this reason, when it judges whether two parallel lines exist at the following step 214 and it is judged that two parallel lines exist, parallel lines are divided in step 215 and two parallel lines with an equal length are extracted as wall data in step 216, and while the extracted data are recorded on the predetermined area of RAM, it eliminates from plan data.

[0027] In this case, as shown in drawing 13 (1), it is parallel to **** C1, C2, and C3, and, as for the parallel lines located in the equal distance, a segment L7 and the segment L8 are searched corresponding to a segment L3, the segment L4, and **** C3 corresponding to a segment L1, the segments L2, L5, and L6, and **** C2 corresponding to **** C1. this time -- one wall -- on the way -- the segment which doubles with the length of **** C1, C2, and C3, and expresses a wall as shown in drawing 13 (2) in consideration of coming out and modalities differing -- segments L1 and L8 are divided Next, segments L1 and L2 are divided so that it may become the group of the parallel lines with an equal length, as shown in drawing 13 (3). Then, as shown in drawing 13 (4), two segments with an equal length which are the groups of parallel lines are recognized to be walls, make this wall data, and extract and eliminate it.

[0028] Thus, since the cylinder is contained in the plan data from which the parallel lines of the fraction recognized to be a wall were eliminated, the segment which passes as shown in drawing 13 (5), and remains heart R or near the intersection of **** C1, C2, and C3 is searched with the following step 218, the searched segment is connected, and a closed graphic is created. In this case, as between the endpoints of a segment serves as a curtate distance, it creates a closed graphic. Next, it judges whether when the area of a closed graphic distinguishes whether it is beyond a predetermined value (this example 600x 600= 3600mm) in step 220, a closed square shape exists near the intersection, and as shown in drawing 13 (6), when area is beyond a predetermined value, a closed graphic recognizes it as it being a cylinder, and progresses to step 220. On the other hand, as shown in drawing 13 (7), while area records the data which the closed graphic has recognized to be a part of wall in the case of negative judgment, extracted as wall data, and were extracted on the predetermined area of RAM under with a predetermined value, it eliminates from plan data.

[0029] As step 220 is shown in drawing 14 (1) - (3), the modality of cylinder If all interior angles is [a closed graphic] abbreviation right angles in four square shapes and the center of radii has the same "prism" closed graphic only with radii, a "circular cylinder", If it is except these, it is determined that it will be either of the "variant cylinders", a closed graphic is extracted as cylinder data, and while the extracted data are recorded on the predetermined area of RAM, it eliminates from plan data.

[0030] In addition, as a cylinder is not buried in a wall but it is shown in drawing 11 only in the case of a wall, a door is recognized, and since door data are eliminated from plan data (step 208), the group of two parallel lines P1 and P2 and the group of two parallel lines P3 and P4 are recognized as walls W1 and W2. segments P6 and P7 -- a segment -- since it becomes P5 and a group and one wall is constituted, the segments P6 and P7 separated at the narrow spacing are recognized as one segment, and can recognize a wall W3 by the group of segments P6 and P7 and P5

[0031] Moreover, when only a cylinder exists independently, in step 218 and step 220, a cylinder is recognized like the above-mentioned processing.

[0032] Next, standardization processing which determines the detailed dimension of step 112 is explained: Standardization processing in this example includes the write-in dimension recognition. Moreover, at this step 112, the outer wall data by the outer wall designation recorded on RAM which gave [above-mentioned] explanation are referred to. First, the dimension

recognition of the member with a write-in dimension is searched and carried out. In this case, it searches according to the same sequence as the above-mentioned member recognition processing, and a dimension recognition is carried out. With reference to Table 1 or 2 explained above, the dimension recognition of the member without a write-in dimension is carried out. As shown in drawing 15 (1), when the dimension (W180) is filled in near the wall, the line of both sides, i.e., the data which write in parallel lines by making it move the same amount every on the basis of **** C5, and are in agreement with a dimension, is generated focusing on **** C5. In addition, since outer wall designation is made as explained above, when the corresponding wall is an outer wall, an external position is made to fix and it may be made to move an internal position.

[0033] When it writes in a cylinder and there is a dimension, a detailed dimension is determined after this cylinder carries out a dimension recognition. Since it faces moving the position of the segment and radii which standardize a cylinder and criteria are needed, a reference point or the datum line is set up.

[0034] For example, as shown in drawing 15 (2), when only the dimension (800x1000) is filled in near the cylinder, it recognizes as a common type cylinder. in this case -- since one segment of the recognized cylinder is in agreement with the segment showing a wall, while the segment of a cylinder is located in the datum line, using as the datum line the segment which was in agreement with the segment showing this wall -- a passage -- a heart R2 top -- a reference point (intersection of the diagonal line of a cylinder) -- being located -- as -- each -- the data which write in by moving a segment and are in agreement with a dimension are generated

[0035] it is shown in drawing 15 (3) -- as -- a notation "*" -- with -- the case where the dimension (*800x1000) is filled in near the cylinder -- a wall separation type cylinder ****** -- recognizing -- a passage -- the intersection of the heart -- a reference point -- carrying out -- this reference point **** -- each -- the data which write in by moving a segment and are in agreement with a dimension are generated

[0036] When the cylinder recognized as shown in drawing 15 (4) does not touch outside but exists in the interior, the data which write in on the basis of the intersection of the diagonal line of a cylinder, and are in agreement with a dimension are generated.

[0037] since [in addition,] there is little other relevance when a cylinder exists independently -- a passage -- the intersection of the heart -- a reference point -- carrying out -- each -- what is necessary is just to generate the data which write in by moving a segment and are in agreement with a dimension

[0038] Moreover, when the cylinder has been recognized in contact with an outer wall, it carries out like the following [setup of criteria], and a reference point is set up.

[0039] [A setup of criteria]

** In the case of a prism (a polygon is included), among the periphery sides of - cylinder (each other was adjoined), the 2nd page and when a wall is in the same side, let this intersection of the 2nd page be a reference point (refer to drawing 16 (1)).

- Among the periphery sides of a cylinder, when a wall is in the same side with the 1st page of either, let the intersection of the heart be a reference point as this field (refer to drawing 16 (2)).

- the case where there is no ** of the periphery side of a cylinder in the same field as a wall -- a passage -- the heart -- let an intersection be a reference point (refer to drawing 16 (3))

** Let the intersection of the heart be a reference point as the case of an independent cylinder and a tubular pole (refer to drawing 17 (1)).

** A rectangle cylinder passes, and when not parallel to the heart (or ****), let the intersection of the heart be a reference point a passage (refer to drawing 17 (2)).

** When the passage heart does not lie at right angles, let the intersection of the heart be a reference point a passage (refer to drawing 17 (3)).

[0040] In addition, standardization of a variant cylinder is processed only when there is a write-in dimension. When radii are not included, this processing makes the intersection of an outer wall a reference point, or makes the intersection of the passage heart a reference point. On the other hand, when radii are included, according to write-in data, it is determined that they will be a circular cylinder or a prism, and it processes.

[0041] Thus, the position and field on the plan of each part material are judged, and since the detailed coordinate data which becomes settled for every each part material as which a dimension and a detailed position, and a detailed field were determined since standardization processing which determines the detailed dimension of each part material was performed can be found, detail drawing (drawing 6) can be created automatically easily.

[0042] Next, back process processing of step 116 is explained with reference to the development generating routine of drawing 4 . An operator specifies the domain (domain enclosed with the dotted line of drawing 7) which creates a development with reference to the tablet 16 or CRT12 as which the detail drawing created automatically is displayed. The data with the detailed member contained within limits the step 300 smell lever was specified to be are read, and the height data (floor height) inputted at the following step 302 are read. A development (drawing 8) is automatically created using the technique known for CAD using the data and height data of a member which were read, and it expresses to the tablet 16 or CRT12 as the following step 304.

[0043] Since it recognizes in the order of the fittings of a door (door) or an aperture, a wall, and a cylinder according to this example as explained above Since the member which mistakes each part material, can recognize that there is nothing, and has been recognized is standardized to detailed data While members, such as **** of general drawing drawn by CAD, a cylinder, a wall, and fittings, a write-in dimension and a dimension table in case write in and there is nothing, and the finishing thick table of a wall class are recognized and a member dimension is standardized The automatic generation of a finishing line and the dimension line can be carried out, and a detailed drawing can be easily created from simple drawing data.